ABSTRACT OF THE DISCLOSURE

The design methods and apparatuses of photodiodes with adaptive structures to achieve smooth and wavelength-selective responses are proposed. By using the adequate sizes of the photo-sensing areas and gains of the back-end amplifiers towards the different photo-responses of multiple photodiodes, the photo-responses from these photodiodes are summed together to yield the uniform distribution of the total photo-responses. Based on the physical characteristics of the process parameters, the equation of the photo-responses for the PN junction is derived to find the optimized values of the process parameters for increasing the photo-response and achieving the peak value of the photo-responses at a specific wavelength. The photodiode with multiple PN junctions and multiple switches is designed to achieve multiple photo-responses in a single photodiode. By using the switches to turn off the unused PN junctions, the selected PN junctions can generate the required photo-responses. Hence, this kind of the photodiode can sense multiple colors without using color filters.